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Evaluation of touch sense of upper limbs using sine-wave current

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Background, Motivation and Objective. A large number of people still develop disabilities after peripheral neuropathies. Semmes-Weinstein monofilaments have been widely used to quantify touch thresholds in these cases. However, it is an instrument of low sensitivity with subjective responses. Against this fact, in the 1980s, a procedure was proposed for the psychophysical assessment of touch sensibility by sine-wave electric stimulation. This assessment was based on studies that suggested sinusoidal stimuli of different frequencies would excite sensory systems related to fibers of different diameters, thus increasing the selectivity of the stimulation. The objective of this study is to evaluate and describe the Current Perception Threshold (CPT) for the upper limbs nerves of healthy subjects using sine-wave electric stimulation.

Methods. The sample (n = 50) was composed of men and women with an average of 40 years (±15 years), with no previous diagnosed neuropathy. All subjects had the ulnar, median and radial nerves evaluated with a sine-wave electric stimulator (NEUROSTIM) developed in local engineering school (COPPE/UFRJ) to quantify the CPT, for the frequencies 1Hz, 250Hz and 3000Hz.

Results. The CPT for the three used frequencies (3000Hz, 250Hz and 1Hz) were, respectively: Ulnar (897µA, 288µA, 438µA); Median (1099µA, 368µA, 276µA), Radial (1096µA, 366µA, 226µA).

Discussion and Conclusions. The NEUROSTIM evaluation protocol seems to be effective, objective and sensitive and able to be replicated for the evaluation of sensory loss through touch sensibility. NEUROSTIM might reduce the test subjectivity because it has variables, such as frequency and intensity of the stimulus better controlled as well as the quality and quantity of stimulus. The ability to evaluate thin touch fibers adds a lot to the neurologic evaluation, since they are the first ones suffering damage in most peripheral neuropathies as leprosy, diabetes and others.

Keywords. Sine-wave, electric stimulation, neuropathy.